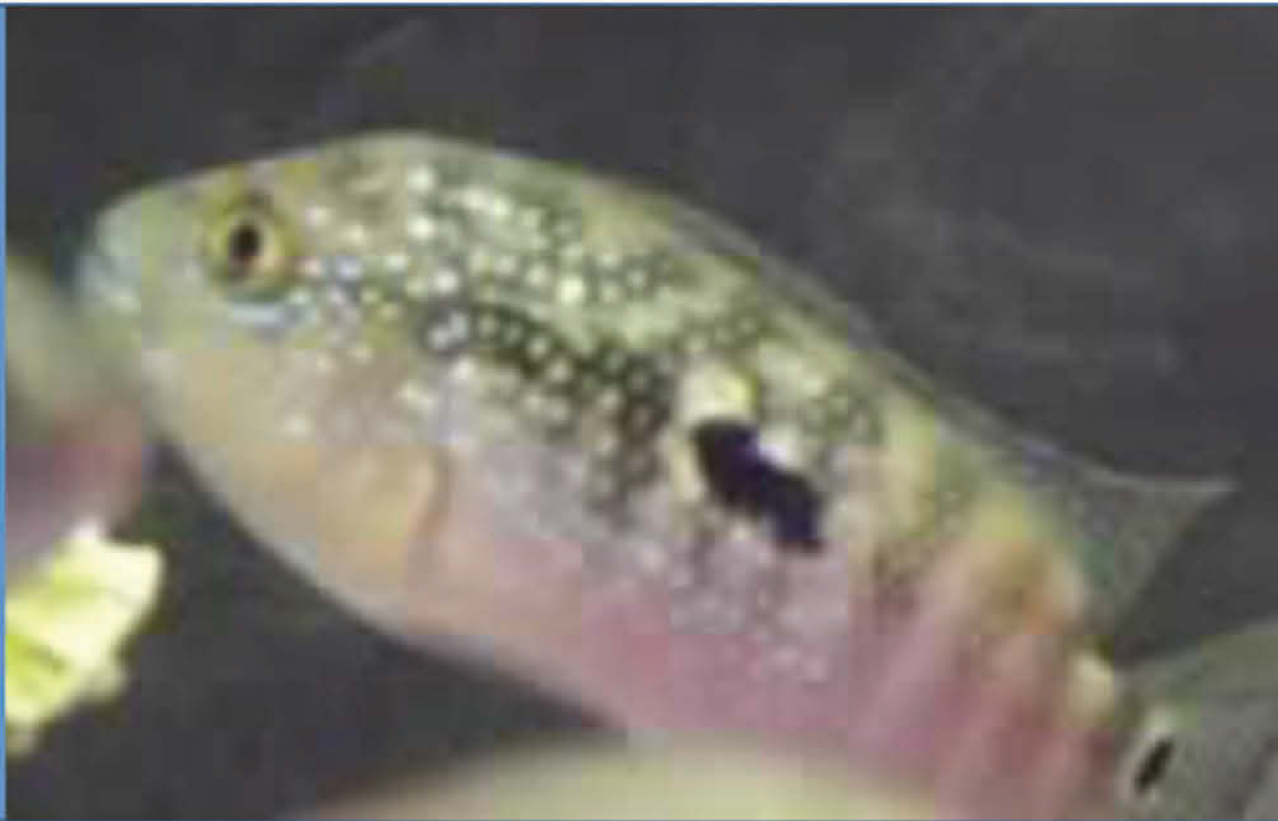


Comparing Aggression Levels in Jack Dempsey Cichlids based on Variation of Habitat Structure

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Introduction

Jack Dempsey cichlids, *Rocio octofasciata*, are native to South America and known for their aggressive behaviors. These fish are popular in freshwater aquariums, but can act aggressively towards other fish. In many species of fish individuals may behave aggressively to defend resources and the decision to defend these resources depends on factors such as habitat complexity (Oldfield 2011). Cichlids thus need ample room to maintain individual territories. Behavioral patterns in other species of cichlids have observed that the establishment of territories is constantly changing (Dijkstra et al. 2009). Individuals use information such as habitat complexity to adapt to environments, even if the environment is variable (Peake & McGregor 2004). Our hypothesis is that reducing habitat structure will increase aggression levels in confined Jack Dempsey cichlids.

Materials and Methods

Four cichlids were used in a ten-gallon freshwater aquarium set-up. Some cichlids were replaced during experimentation, but this should not affect results because similar sized fish were used and further research would be delayed for and acclimation period. Three levels of habitat structures were established using plant ornaments and clay flowerpots (Table 1, Figures 1-3), and our setup and research procedures were modeled after a comparable experiment with a different species of cichlid (Barley & Coleman 2010). 24 hours before an experiment trial, the aquarium habitat would be changed to one of the randomly selected habitat levels. After 24 hours the number of aggressive behaviors among all four fish (overall, not individual-specific) was observed for a thirty-minute period. 24 hours after the previous trial, the process was repeated and observed again. Five sets of trials were conducted and the total counts for chases and bites were averaged at each habitat level. Chases were counted as one fish approaching and pursuing another fish, in which both fish had to be in motion. Bites were counted when one fish physically made contact with and bit another fish. Potential differences in aggressive behaviors among habitats was tested using a one-way ANOVA using JMP (10.0.0 2012).

	Low	Medium	High
Large Plants	1	2	3
Small Plants	3	3	3
Flower Pots	1	2	5

Table 1: Structure of each habitat level.

Results

A Tukey test was performed, and our data showed that the number of chases varied by habitat, where the lower habitat (f ratio=24.9461, $p < 0.0001$) was significantly different from the high and medium habitats (f ratio=10.1357, $p < 0.4771$). The number of bites also varied by habitat, where the lower habitat (f ratio= 24.9461, $p < 0.0004$) was significantly different from the high and medium habitats (f ratio= 10.1357, $p < 0.7054$). The medium and high habitats (B) are similar as shown by the data in respects to the low habitat (A) (Figure 4). The average number of aggressive behaviors exhibited in “medium” and “high” habitat is 8.41. The low habitat average is 28.43, which is triple the amount observed in the lower habitat structures. The low habitat was associated with significantly more chases and bites than the medium and high habitats. This can be attributed to the cichlids’ natural aggression patterns with the lack of complexity. There was no statistical significance between the high and medium levels. With this being said there is only a slight difference between the medium and high habitats that could be more defined with a larger sample size to collect more data.



Figure 1: The “Low” Habitat set-up



Figure 2: The “Medium” Habitat set-up



Figure 3: The “High” Habitat set-up

Aggressive Behavior over Varying Habitats

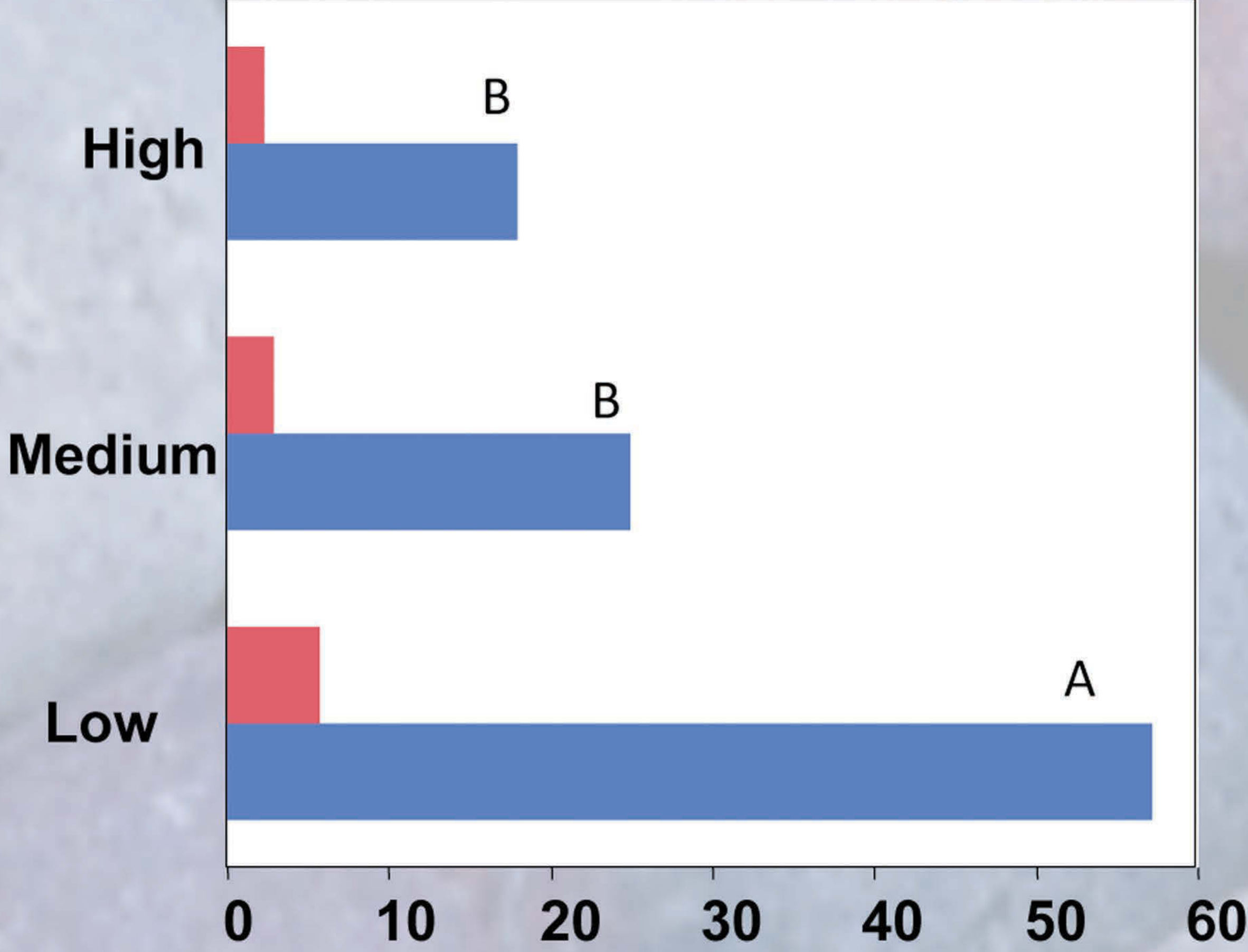


Figure 4: Average bites (red) and chases (blue over five trials for each habitat level. Letters ‘A’ and ‘B’ represent categories created in a Tukey Comparison of Means test.

Conclusion

It was found that Jack Dempsey cichlids are strikingly more aggressive in the sparse, “Low” habitat structure, supporting the hypothesis. Comparable results were found in studies with Convict cichlids, where aggression decreased as habitat structure increased (Barley & Coleman 2010). Aggression decreased proportionally as the habitat increased in complexity (i.e. “Medium” and “High” habitats). Chases were the most common aggressive behavior in our study, which is a similar finding to results from studies with other species of cichlids (Gumm & Itzkowitz 2007). Certainly, Jack Dempsey cichlids aggression is affected by the surroundings. In other studies aggressive behavior was observed using presence or absence of stripes (Reddon et al. 2009). Further studies may be conducted using computer animations to study environmental preferences among cichlids (Baldauf et al. 2009).

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